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STRIATIONS IN GRAVEL BARS OF THE YUKON AND PORCUPINE RIVERS, ALASKA[1]

V. H. BARNETT

The presence of furrows in gravel bars of spreading and meandering streams in Alaska seems not to have been mentioned in the literature on Alaskan geology.

These channels may be seen on the extensive bars of the Yukon and of the Porcupine rivers throughout the Yukon Flats. The bars are remarkably well developed along the Porcupine for about a hundred miles above its union with the Yukon and in low water they are exposed as broad, gravelly, and sandy beaches from one to five miles in extent. These extensive bars give excellent opportunity to observe the striations. An uprooted tree is often seen lodged on a bar with a channel marking its trail (Fig. 1).

Three hypotheses may be offered in explanation of these furrows: first, that they are caused by tree trunks held firmly to the river bottom, either by accumulated débris or ice, and moved forward by the force of the stream; second, that they are caused by blocks of ice beneath a load or ice jam and moved forward in the breakup; or, third, that they are due to trees passing over bars only partly supported by water, the current banking up behind the stump, though having sufficient force to push slowly along, yet not able to remove the marks of the tree.

The third method would seem a simple explanation for the origin of the furrow shown in Fig. 1. Here an uprooted pine tree may be seen at the down-stream side with a straight furrow passing up stream.

It does not seem to the writer that any accumulation of débris that might collect in the roots of a tree would be competent to hold it to the bottom with sufficient force to make the furrows shown in

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[1] Published by permission of the Director of the U. S. Geological Survey.

Fig. 2. The force of the water would tend to relieve the roots of any material competent to sink the tree, such as rocks or frozen earth. The only other material at hand to which one might ascribe such a force, is ice.

There is evidence that during the ice breakup of spring, great pressure is exerted on the banks and shallow portions of the stream.[1]

At a number of places last summer the writer observed talus where rock fragments were pressed into a pavement. These were seen both along the Yukon and along the Porcupine rivers. Russell[2] in his paper on the surface geology of Alaska speaks of the river ice as producing pavements of pebbles along the banks and of the pebbles being faced and striated on their upper side. These pavements occur between the high-water and low-water lines, and as the water was low

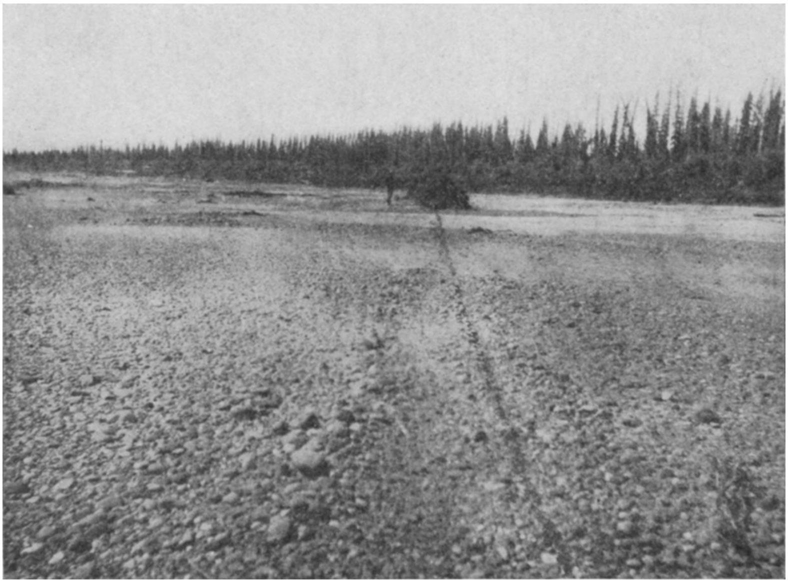

FIG. 1

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[1] For an account of the "breakup" see F. C. Schrader, "Professional Paper," *U. S. Geological Survey No. 20,* 1904, pp. 15, 16. Also see Stoney, *Naval Exploration in Alaska,* U. S. Naval Institution, Annapolis, Md., 1900, p. 52.

[2] *Bulletin of the Geological Society of America,* Vol. I, 1890, pp. 119, 120.

at the time of the writer's visit, an excellent opportunity was presented to observe them. The pavements are composed of variously sized rock fragments, from a few inches in diameter up to two or three feet, sometimes water-worn, but more often angular, with their upper side smooth and striated parallel to the stream.

There seems no doubt, therefore, that moving ice if equipped with proper means could produce the furrows observed in the gravels.

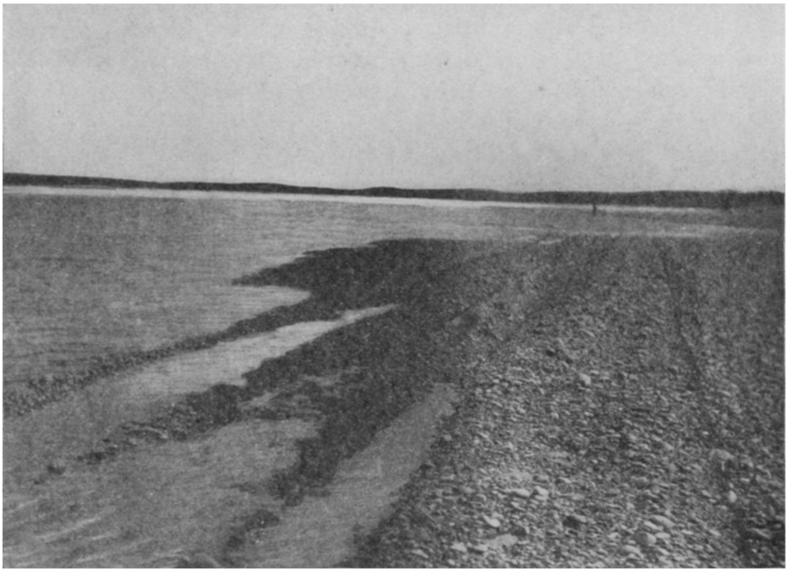

FIG. 2

Cut banks occur on one side or the other of the rivers throughout the flats, from which spruce trees are certainly tumbling during summer. An uprooted tree held to the river bank by some of its roots would serve as a lodgment for drifting trees and the whole mass would be frozen in the ice as it formed. In the spring, with the heavy pressure of an ice jam, the mass would be dragged along intact, producing such forms as shown in Fig. 2, but ice blocks caught in the jam probably occupy an equally important place in the origin of these lines.